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ABSTRACT

Background, rationale, and promising practices for teaching about science-related social issues in the science and social studies classroom are presented. Material is divided into five sections, each introduced with a topical question. The first section considers the challenges associated with the pervasive influences of science and technology in modern society, while the second section examines the extent to which these challenges are being met. The following indicators are reviewed: national reports and guidelines; research on student knowledge and attitudes regarding science, technology, and society; and current curricula and textbook analyses. The third section examines ways in which educators can improve the education of citizens in science-technology-society issues. The final section outlines promising practices for teaching this content and skill area. Decision trees, role plays, and simulations are among the strategies discussed. A number of recommendations are presented. A 17-entry resource section concludes the document. (LP)

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CHALLENGES FOR THE SOCIAL STUDIES

ERIC Digest No. 16

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SCIENCE-RELATED SOCIAL ISSUES: CHALLENGES FOR THE SOCIAL STUDIES

by John J. Patrick and Richard C. Remy

Education for good citizenship, a primary goal of American schools in general and the social studies in particular, is becoming extremely complex, a result of the pervasive and powerful effects of science and technology in society.

This ERIC Digest considers (1) challenges associated with science-related social issues, (2) the extent to which these challenges are recognized and being met, (3) ways in which educators can improve the education of citizens in science/technology/society issues, (4) and promising practices that can contribute to building connections between social studies and science curricula.

What are the challenges associated with the pervasive influences of science and technology in modern society?

Educators today face three major challenges in preparing citizens to exercise their rights and responsibilities of self-government:

- Informing citizens about complex social issues related to advances in science and technology: decisions about these issues involve knowledge and ethics and often require "trade-offs" between conflicting values;
- Connecting distinct fields of knowledge in the school curriculum in order to maximize understanding of the social effects of science and technology;
- Answering antagonists who attempt to subvert science education in the schools and threaten to limit or overturn projects in science and technology that contradict conventional wisdom.

To what extent are these challenges being met?

Indicators of the degree to which the challenges of science and technology are currently being met in social studies and science curricula include current statements of educational goals in national reports, curriculum guides, and professional association proclamations; national assessments of learners; and assessments of textbooks and other curriculum materials.

National reports and guidelines. Major curriculum reform reports have proposed new educational goals that respond to the key challenges facing citizenship education we have identified. These reports stress the need to include significant attention to the connections of science, technology, and society in the general education of citizens. Scientific literacy is seen as a prerequisite for responsible citizenship in today's complex, high-tech world.

Specific reports and guidelines that address these issues include:

- *High School: A Report on Secondary Education in America* also known as "The Carnegie Report" (1983)
- *A Nation At Risk*, National Commission on Excellence in Education (1983)
- "Guidelines for Teaching Science-Related Social Issues," National Council for the Social Studies (1983)
- *Educating Americans for the 21st Century*, National Science Board Commission (1983)
- "Toward New Meaning for School Science," National Science Teachers Association (1984)
- *Reforming Science Education: The Search for a New Vision*, Council for Basic Education (1984)

Research findings on student knowledge and attitudes regarding science, technology, and society. Three nationwide assessments of learning point to a large gap between newly-stated goals and current classroom realities. These studies are: (1) the National Assessment of Educational Progress (NAEP) study of "Attitudes Toward Science" conducted in 1976-77 and reported in 1979, (2) the Science Assessment and Research Project (SARP) 1981-82 study "Images of Science" reported in 1983, and (3) the National Public Affairs Study (NPAS) titled "Citizenship in an Age of Science" based on a 1978 survey reported in 1980.

These recent national assessments of learners suggest students lack an understanding of the nature of science as a human endeavor, confidence in and support for science, a commitment to dealing with social problems generated by science and technology, and basic knowledge of key science/technology/society issues.

Current curricula and textbook analyses. National curriculum studies sponsored by the National Science Foundation (1979), the Social Science Education Consortium, (Morrisett 1982) and university-based scholars reveal lack of attention to science/technology/society issues and to instructional strategies which could connect learning in science and social studies.

Analyses of social studies textbooks, although limited in number and scope, suggest that new goals of citizenship education, which pertain to science/technology/society themes and issues, have not become prominent in main-line courses—American history, government, civics, geography, world history—where they could be related logically to traditional content. It has become trendy to proclaim these new goals at conferences and in professional journals, but they have not yet become a national trend in the curricula of our schools.

How, then, can educators improve the education of citizens in science/technology/society issues?

The social studies and the sciences have distinct but complementary contributions to make to student learning about the social effects of science and technology. The social studies contribute to an understanding of the ethical and value components of science and technology issues. As scientists themselves readily point out, the moral, social, and values dimensions of decision making about such issues are outside the realm of science. Science, on the other hand, contributes vital knowledge about alternative courses of action and their likely consequences. Scientific knowledge is essential to weighing the validity of competing factual claims about complex issues. Citizen appreciation of both the contribution and limitations of science in the resolution of science/technology/society issues rests on an understanding of the complementary nature of the sciences, social studies, and humanities.

However we might wish otherwise, there is no broad theory of knowledge which incorporates the social studies

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and the sciences. As a result there is no organized body of facts, concepts and theory upon which to build an interdisciplinary course focused on social problems. The history of curriculum reform efforts clearly indicates that past efforts to create such courses have met with little success. Such efforts typically suffer from the inability of teachers and students to deal with vast amounts of raw information without the organizing help of a disciplinary approach and from the lack of historical perspectives on the problems under study.

To recognize these difficulties does not mean the only alternative is rigid compartmentalization of the academic disciplines. "Integrative threads" can be used to provide common learning experiences within and between distinct courses in the social studies and the sciences. "Integrative threads" are themes, concepts, principles, or methods of thinking that can link learning experiences within or between separate fields of knowledge.

The essential elements of decision making, for example, comprise a generalizable problem-solving routine that can be applied to a wide range of science/technology/society issues at both the personal and public policy level. Appropriate study of decision making can occur in both science and social studies courses at various levels of complexity with students of different ages. A variety of promising instructional practices are available to implement instruction focused on decision making.

Which promising practices can contribute to building connections between social studies and science curricula?

Three types of instructional practices hold considerable promise for building connections between and within social studies and science curricula: the use of decision trees and case studies, the use of role play and simulation, and the use of instructional television and microcomputers.

Decision trees, role plays, and simulations organize subject matter and involve cognitive operations in ways which can help learners apply the perspectives of both the social studies and science in studying complex social issues. Thus, these instructional strategies are useful tools for building connections between social studies and science education. Proper application of such techniques can help students develop decision-making skills and acquire basic information about science/technology/society issues in distinct science and social studies courses.

Instructional television and microcomputers are also capable of connecting learning experiences in social studies and science. Television can dramatize issues and problems. Microcomputers can give students, working individually or in groups, the opportunity to work in dynamic ways on decision-making problems.

Science educators are undertaking systematic efforts to locate exemplary instructional practices relevant to teaching about science, technology, and society. In the process they are identifying common characteristics of successful programs and generating enthusiasm for this curriculum reform.

Two such efforts are the "Search for Excellence in Science Education," sponsored by the National Science Teachers Association, the Council of State Science Supervisors, and the National Science Supervisors Association and "Teaching Science via Science, Technology and Society," headquartered at the Pennsylvania State University's Science, Technology and Society Program and funded by the National Science Foundation. The Search for Excellence Project selected 50 science programs around the United States for special recognition as "national exemplars." Ten of these programs excelled in connecting science and technology to social contexts and in developing skills through extensive practice in decision making about social issues. The Teaching Science Project at Pennsylvania State seeks to promote greater attention to science, technology, society subject matter in the junior and senior high science curriculum through creating a network, identifying relevant teaching materials, disseminating information about these materials, and holding national and regional workshops.

These two projects, however, are directed primarily toward science educators. Social studies educators should consider the possibilities associated with developing and undertaking parallel or complementary efforts.

Recommendations.

Following are key ideas which depict major challenges and opportunities posed for all educators.

1. Education for competent citizenship must equip individuals with basic understandings and capacities they need to follow and to participate in decisions about complex social issues related to science and technology.
2. Education for competent citizenship should connect distinct fields of knowledge in the school curriculum to maximize students' understanding of and capacity to think about the social effects of science and technology.
3. In lieu of an interdisciplinary curriculum, educators must find and use "integrative threads" that make up for the lack of a conceptual framework linking science and social studies.
4. Decision making can be a powerful integrative thread for linking social studies and science instruction.

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